REMARKS

Favorable reconsideration of this application as presently amended and in light of the following discussion is respectfully requested.

Claims 1-29 are pending in the present application. Claims 1, 12, 20 and 26 have been amended by the present amendment.

In the outstanding Office Action, the drawings were objected to; Claim 12-19 were rejected under 35 U.S.C. § 112, first paragraph; Claims 1, 3, 10, 12, 18, 20, 23, 26 and 28 were rejected under 35 U.S.C. § 103(a) as unpatentable over Applicants' prior art (APA) in view of Hotta et al; Claims 2, 8, 13, 17, 21 and 24 were rejected under 35 U.S.C. § 103(a) as unpatentable over APA in view of Hotta et al and Suzuki; Claims 4 and 14 were rejected under 35 U.S.C. § 103(a) as unpatentable over APA in view of Hotta et al and Ohtake et al; Claims 5, 9, 11, 15, 19, 22, 25, 27 and 29 were rejected under 35 U.S.C. § 103(a) as unpatentable over APA in view of Hotta et al and Fassel et al; Claim 8 was rejected under 35 U.S.C. § 103(a) as unpatentable over APA in view of Hotta et al, Suzuki and Fassel et al; and Claims 6 and 16 were rejected under 35 U.S.C. § 103(a) as unpatentable over APA in view of Hotta et al, Ohtake et al and Fassel et al.

Regarding the objection to the drawings, the outstanding Office Action states the supply means, first means, second means and detecting means as claimed in Claims 12-19 and the claimed subject matter of Claims 1, 10, 12, and 26 of the commuter with a contact electrode part must be shown or the features cancelled from the drawings.

Applicants note Claims 12-17 are similar to Claims 1-9, but use means-plus-function terminology (i.e., Claims 1-9 are apparatus type claims, and Claims 12-17 are means-plus-function claims). Likewise, Claims 18-19 are similar to Claims 10 and 11, but use means-

plus-function terminology (i.e., Claims 10-11 are apparatus type claims and Claims 18-19 are means-plus-function claims). For example, the "means for supplying electric power" recited in Claim 12 corresponds to the electrode brushes 16 shown in the figures and described in the specification. Similarly, the "means for suppressing noise" recited in Claim 13 is directed to the noise suppression elements 24 and 25, shown in Figures 3 and 6, for example. Likewise, the "means for supporting" and the "means for connecting" recited in Claim 14 correspond to the support base 13 and the external terminals 16c respectively shown in Figure 1, for example. The other means elements recited in the claim are similarly shown in the drawings. Regarding the claimed subject matter of Claims 1, 10, 12 and 26, Applicants note the commuter including the contact electrode part is described in the specification (see page 8, lines 21-24, for example) and illustrated in the figures (such as Figure 2), in which the commuter is constructed with three contact electrode parts 23a. Accordingly, it is respectfully requested the objections to the drawings be withdrawn.

Regarding the rejection of Claims 12-19 under 35 U.S.C. § 112, first paragraph, similar arguments applied to this rejection as that discussed above with respect to the drawings. That is, each of the means recited in these claims are shown in the figures and disclosed in the specification as discussed above. Accordingly, it is respectfully requested this rejection be withdrawn.

Claims 1, 3, 10, 12, 18, 20, 23, 26 and 28 stand rejected under 35 U.S.C. § 103(a) as unpatentable over APA in view of Hotta et al. This rejection is respectfully traversed.

Similar arguments apply to independent Claims 1, 12, 20 and 26 and separate but similar arguments apply to independent Claims 10, 18 and 28. Accordingly, arguments will first be presented distinguishing amended independent Claims 1, 12, 20 and 26 over this

rejection and then arguments will be presented distinguishing the independent Claims 10, 18 and 28 (which have not been amended) over this rejection.

The present invention as recited in amended independent Claim 1 is directed to a flat disc-shaped electrical parts mounting base board fixed on a rotation shaft such that the rotation shaft perpendicularly intersects the electrical parts mounting baseboard, and a commuter including a contact electrode part with a plane conductive layer pattern and connected to the rotor coils. The contact electrode part is formed on one surface of the electrical parts mounting baseboard. Independent Claims 12, 20 and 26 recite similar features.

In a nonlimiting example, Figures 1 and 2 illustrate a flat disc-shaped printed circuit board 23 fixed on the rotation shaft 21 such that the rotation shaft perpendicularly intersects the printed circuit board 23 (see page 10, lines 6-8). Further, the commuter includes contact electrode parts 23a formed of a conductive foil on one surface of the flat disc-shaped printed circuit board 23. The electrode brushes 16, which are previously fixed to the support base 13, press the surface of the contact electrode parts 23a in the axial direction of the rotation shaft 21 (see page 10, lines 17-20).

In assembling the DC motor, because the printed circuit board 23 and the support base 13 holding the electrode brushes 16 are merely assembled in order along the axial direction of the rotation shaft 21, there is no interference between the commutator and the electrode brushes 16 during assembly. Therefore, deformation of the electrode brushes 16 due to contact with the commutator during assembly does not occur. Consequently, the reliability of the motor operation is ensured (see page 10, line 21 to page 11, line 1).

Further, because the commutator is arranged on the flat printed circuit board 23, and the pair of electrode brushes 16A and 16B contacts the surface of the commutator in the same plane, the commutator and the support base 13 holding the electrode brushes 16 can be easily and smoothly assembled. Further, because it is easier to assemble the DC motor, mass-productivity of the DC motor is improved (see page 11, lines 2-6).

With the above described construction, the number of construction parts and the number of manufacturing processes can be reduced. As a result, the cost of the DC motor can be lowered. Moreover, because the commutator is formed on the flat primed circuit board 23, the axially extending space occupied by the commutator can be reduced when compared to the cylinder-shaped background commutator. Accordingly, the size of the DC motor in the axial direction of the rotation shaft 21 can be effectively reduced (see page 11, lines 7-13).

The outstanding Office Action recognizes APA does not disclose an electrical parts mounting baseboard in contact with the rotational shaft and a commutator including a contact electrode part formed with a plane conductive layer, and relies on Figure 4B of Hotta et al as teaching this feature. In particular, the outstanding Office Action states Hotta et al illustrates in Figure 4B a commutator 30 having a contact electrode part 13 formed with a plane conductive layer (metallic carbon layer 5) and the contact electrode part 13 being formed on the electrical parts mounting baseboard (commutator acting as a baseboard) 30.

However, Applicants assert that the commutator 30 does not correspond to the claimed commutator being formed on one surface of the flat disc-shaped electrical parts mounting baseboard. Rather, the commuter in Figure 4B of Hotta et al is similar to the

cylinder-shaped background commutator shown in Figure 17 of the present invention, for example.

Further, the contact electrode part 13 of Figure 4B of Hotta et al is clearly not formed on one surface of a flat disc-shaped electrical parts mounting baseboard (the outstanding Office Action indicates the commutator 30 also acts as an electrical parts mounting baseboard).

Further, Applicants note dependent Claims 3 and 9 recite that the respective electrode brushes are split into plural separate portions, and sliding contacts of the separate portions with the contact electrode part of the commutator cause a phase difference due to a shift of rotation angle positions of the sliding contacts of the separate portions relative to the contact electrode part.

In a non-limiting example, Figure 2 illustrate the electrode brushes 16 being split into plural separate portions. In more detail, Figure 2 illustrates the pair of electrode brushes 16 including a first electrode brush 16A and a second electrode brush 16B. As illustrated in Figure 2, part of the first electrode brush 16A is split into two separate portions 16Aa and 16Bb. Like the first electrode brush 16A, part of the second electrode 16B is split into two separate portions 16Ba and Bb having substantially the same width as that of the separate portions 16Aa and 16Ab (see page 8, lines 6-17).

The outstanding Office Action states APA illustrates these features. However, Applicants note APA does not teach or suggest sliding contacts of the separate portions with the contact electrode part of the commutator causing a phase difference due to a shift of rotation angle positions of the sliding contacts of the separate portions relative to the contact

electrode part. Accordingly, it is respectfully submitted that Claims 3 and 9 further define over the applied art.

Turning now to arguments distinguishing independent Claims 10, 18 and 28 over the applied art.

The present invention as recited in Claim 10 is directed to a direct current motor in which respective sliding contact positions of the electrode brushes with the contact electrode part are shifted in the radial direction. Claims 18 and 28 include similar features.

In a nonlimiting example, Figure 15 illustrates an electrode brush having separate portions 16Aa and 16Ab of the first electrode brush 16A and separate portions 16Ba and 16Bb of the second electrode brush 16B, and thus an electrode brush 30 includes separate portions 30a and 30b. As illustrated in Figure 15, each rotation angle position of the sliding contact of the separate portions 30a and 30b is somewhat shifted relative to the contact electrode part 23a (see page 23, lines 2-7).

When an electrode brush switches from one segment to another segment of contact electrode parts due to rotation of a commutator, the electrode brush may bound at a small gap formed between one segment and another segment of contact electrode parts especially in a high speed rotation of a DC motor. In such a case, the electrode brush is away from the contact electrode parts, thereby causing the DC motor to be in an unstable condition (see page 23, lines 8-12).

However, with the above-described construction of the electrode brush 30, at least one of the separate portions 30a and 30b contacts the contact electrode parts 23a when the electrode brush 30 passes over the gap formed between one segment and another segment of the contact electrode parts 23a. Thereby, the above-described unstable condition of the DC

motor is obviated, so that the reliability of the DC motor is enhanced. (See page 23, lines 13-17).

The outstanding Office Action does not specifically address this feature, and only states the APA discloses the pair of electrode brushes. However, as clearly shown in APA Figure 17, the electrode brushes B01 and B02 do not have respective sliding contact positions of the electrode brushes with the contact electrode part being shifted in the radial direction. Hotta et al also do not teach or suggest these features.

Accordingly, it is respectfully submitted that independent Claims 10, 18 and 28 and each claim depending therefrom also patentably define over the applied art.

Regarding the other rejections noted in the Office Action, it is respectfully noted each of these rejections reject dependent claims using the additional publications of Suzuki, Ohtake et al and Fassel et al. It is respectfully noted that each of these additional publications also do not teach or suggest the features recited in the independent claims. Accordingly, it is respectfully submitted these rejections have also been overcome.

Consequently, in light of the above discussion and in view of the present amendment, the present application is believed to be in condition for allowance and an early and favorable action to that effect is respectfully requested.

Respectfully submitted,

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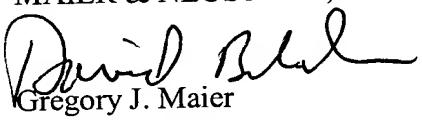

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IN THE CLAIMS

Please amend Claims 1, 12, 20 and 26 to read as follows:

--1. (Amended) A direct current motor, comprising:

a rotor including a rotation shaft and rotor coils;

a stator configured to apply a magnetic field to the rotor via magnetic poles of the stator opposing magnetic poles of the rotor;

[an] a flat disc-shaped electrical parts mounting base board fixed on the rotation shaft such that the rotation shaft perpendicularly intersects the electrical parts mounting base board;

a commutator including a contact electrode part [formed] with a plane conductive layer pattern and connected to the rotor coils, the contact electrode part being formed on one surface of the electrical parts mounting base board; and

a pair of electrode brushes in sliding contact with the contact electrode part of the commutator and configured to supply electric power to the rotor coils through the commutator.

12. (Amended) A direct current motor, comprising:

a rotor including a rotation shaft and rotor coils;

means for applying a magnetic field to the rotor;

[an] a flat disc-shaped electrical parts mounting base board fixed on the rotation shaft such that the rotation shaft perpendicularly intersects to the electrical parts mounting base board;

a commutator including a contact electrode part [formed] with a plane conductive layer pattern and connected to the rotor coils, the contact electrode part being formed on one surface of the electrical parts mounting base board; and

means for supplying electric power to the rotor coils through the commutator, the supplying means being in sliding contact with the contact electrode part of the commutator.

20. (Amended) A method of making a direct current motor with a rotor including a rotation shaft and rotor coils, a stator, [an] a flat disc-shaped electrical parts mounting base board, a commutator including a contact electrode part, and a pair of electrode brushes, said method comprising the steps of:

forming the contact electrode part of the commutator with a plane conductive layer pattern on one surface of the electrical parts mounting base board;

fixing the electrical parts mounting base board on the rotation shaft such that the rotation shaft perpendicularly intersects the electrical parts mounting base board;

providing the pair of electrode brushes on a support base; and

assembling the support base onto the electrical parts mounting base board and the rotation shaft such that the electrode brushes are in sliding contact with the contact electrode part of the commutator in the same plane.

26. (Amended) An apparatus having a direct current motor, comprising:

a rotor including a rotation shaft and rotor coils;

a stator configured to apply a magnetic field to the rotor via magnetic poles of the stator opposing magnetic poles of the rotor;

[an] a flat-disc-shaped electrical parts mounting base board fixed on the rotation shaft such that the rotation shaft perpendicularly intersects the electrical parts mounting base board;

a commutator including a contact electrode part [formed] with a plane conductive layer pattern and connected to the rotor coils, the contact electrode part being formed on one surface of the electrical parts mounting base board; and

a pair of electrode brushes in sliding contact with the contact electrode part of the commutator and configured to supply electric power to the rotor coils through the commutator.--